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Water Insecurity Threatening Global Economic Growth, Political Stability

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Governments, industry, and civil society will face an increasing risk of water insecurity during the next two decades as demand grows and supply is increasingly strained. Moreover, poor governance and resource management, development practices, agriculture, and environmental degradation are also likely to diminish the quantity and quality of water supplies in many parts of the world. While developing countries will continue to experience more acute and pervasive water insecurity, some developed countries will also face strains on their water supplies. Countries that are unable to address water-related challenges probably will face a confluence of challenges, including greater risk of disease, growing inequality, poor economic growth, and a heightened risk of internal political instability. Shared water resources among states are increasingly likely to become flashpoints as water security diminishes and geopolitical competition grows.

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MISMATCH BETWEEN SUPPLY AND DEMAND

Population growth, lifestyle changes, development, and agricultural practices will contribute to an increasing demand for water during the next 20 years. Global water use is likely to increase by 20 to 50 percent above current levels by 2050, with industrial and domestic sectors growing at the fastest pace. Agriculture will remain the largest overall consumer of water, but the relative increase to 2050 is likely to be smaller than other sectors.

- As states' economies grow and people move up the income ladder, their lifestyles often become more water intensive. This trend will occur predominantly through indirect means, such as greater consumption of water intensive foods such as meat, as well as through increased demand for goods that require large quantities of water to produce, such as cars, electronics, clothing, and larger homes.
- Average groundwater use per person probably will increase during the next 20 years. In large parts of the Middle East and South Asia, as well as in Beijing and Mexico City, groundwater is the primary source of water, but years of overexploitation, pollution, and utilization of non-renewable fossil aquifers have severely degraded and reduced the supplies, in some cases irreversibly.
- In many parts of the world, populations already face water insecurity—defined as the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems, and production. Each year, at least four billion people, nearly half in China and India, experience severe water scarcity for at least one month of the year. Nearly 500 million people are exposed to water scarcity all year long. As of 2020, about 2.1 billion people worldwide lack access to safe drinking water or reliable water service.

Development Practices. Many industrial and infrastructure development practices, including overuse of groundwater, surface water diversions, large dams, unregulated mining and extractive industries, and urban development without adequate sanitation, erode water security by reducing soil capacity to store water, thereby decreasing groundwater recharge, and increasing evaporation, erosion, and pollution. Globally about 80 percent of industrial and municipal wastewaters are discharged untreated into waterways that communities use for drinking, bathing, and agriculture. Groundwater pollution is of particular concern as contaminants move more slowly through groundwater than surface water, sometimes taking years or decades to affect water quality.

- In megacities such as Dhaka, Karachi, and Lagos, poor sanitation and waste management practices will increasingly strain water supplies in the next two decades. Lagos, for example, has 200 informal settlements, and 80 percent of residents rely on private water boreholes, increasing the risk of sewage contamination or water supplies.

China's Three Gorges Dam, the Largest Hydropower Structure in the World
A trash collection boat picks up garbage floating on the Yangtze River behind the Three Gorges Dam. China's push for economic growth during the past 40 years has severely degraded water quality and altered the flows of its largest rivers.

- About 3,700 large hydropower dams are planned or under construction worldwide, primarily in Africa and Asia, according to Western academic reporting. These structures often lack careful design, regulation, and management, causing long-term water security problems, such as fragmentation of river systems, damage to fisheries and aquatic ecosystems, increased riverbank and coastal erosion, disruption and flooding of local communities, and decreased water quality.

Agricultural Practices. Global water demand for agriculture—the single largest consumer of water—is projected to increase by 19 percent from current levels by 2050. By 2040, about 40 percent of all irrigated agriculture is expected to face extremely high water stress.

- Irrigation and planting practices are often inefficient and unsustainable; globally about half of the water withdrawn for irrigation does not reach the intended crops or is oversupplied through practices such as flood irrigation and does not result in crop production. In addition, poor soil and planting or other agriculture techniques such as tilling, reduce water infiltration into the ground and increase evaporation.
- Agricultural wastewater runoff is the most prevalent global water quality challenge. The discharge of large quantities of nitrogen and phosphorus into waterways promotes toxic algal blooms and reduces oxygen, causing die-offs of fish and other aquatic organisms.

Abandoned Fishing Boats Along Former Coast of the Aral Sea
The Aral Sea in Central Asia, once one of the world's greatest lakes, is now one of the greatest environmental disasters, measuring only a fraction of its 1950s size because of Soviet-era irrigation projects to grow cotton in the desert.

Environmental Degradation and Climate. Anthropogenic degradation of landscapes and waterscapes as well as climate change are affecting the quantity, quality, and timing of water supplies. Natural land, water, and climate systems are a complex, interdependent network, such that a change in one system can have wide ranging and unintended consequences in the others.

- On average, about 40 percent of all rainfall over land originates from local plant transpiration and evaporation, although the percentage is much higher in some regions. Degraded landscapes that change plant composition or density can have significant impacts on local weather and water availability.
- Multiple climate models and weather observations indicate increasing variability, intensity, and occurrence of droughts and floods over the next several decades. Rainfall almost certainly will decline in mid-latitude regions, and all areas are expected to have higher evaporation rates because of rising temperatures, increasing demand for water for irrigation. At the same time, increased energy and water in the atmosphere is increasing the likelihood of extreme storms and other weather phenomenon.

WEAK GOVERNANCE ENABLING MISMATCH

In many countries, ineffective governance and policies fail to address—and frequently enable—the mismatch between water demand and supply. Corruption and a lack of trust in governing institutions, low prioritization of water issues, and minimal coordination among government entities, the private sector, and civil society all contribute to this mismatch.

Corruption and Trust. Government corruption in the water sector often hinders full and fair enforcement of laws and regulations, diverts money from the development or maintenance of water projects, causes inequities in water distribution, and inflates costs. Corrupt governments frequently invest in large water infrastructure projects, including dams, because they are easy to skim from and offer political as well as economic returns.

- Brazil's "Operation Car Wash" scandal that began in 2014 revealed corruption related to the awarding of construction contracts, including several mega-dams in the Amazon River Basin. The consortium behind one dam was investigated for paying millions of dollars in bribes to the ruling party at the time to secure the concession. This dam destroyed hundreds of square miles of rain forest and crop lands, displacing at least 20,000 people.

Prioritization and Blame Deflection. Many governments consider water governance and management a lower level priority, including in some wealthy, technically savvy countries. Water regulation in some cases is buried in uninfluential ministries or agencies or is relegated as a secondary resource that is managed in a piecemeal manner from other government bodies. In some countries, it is separated from the management and governance of other sectors, including agriculture, energy, and industry, despite water being a critical resource for all of those activities.

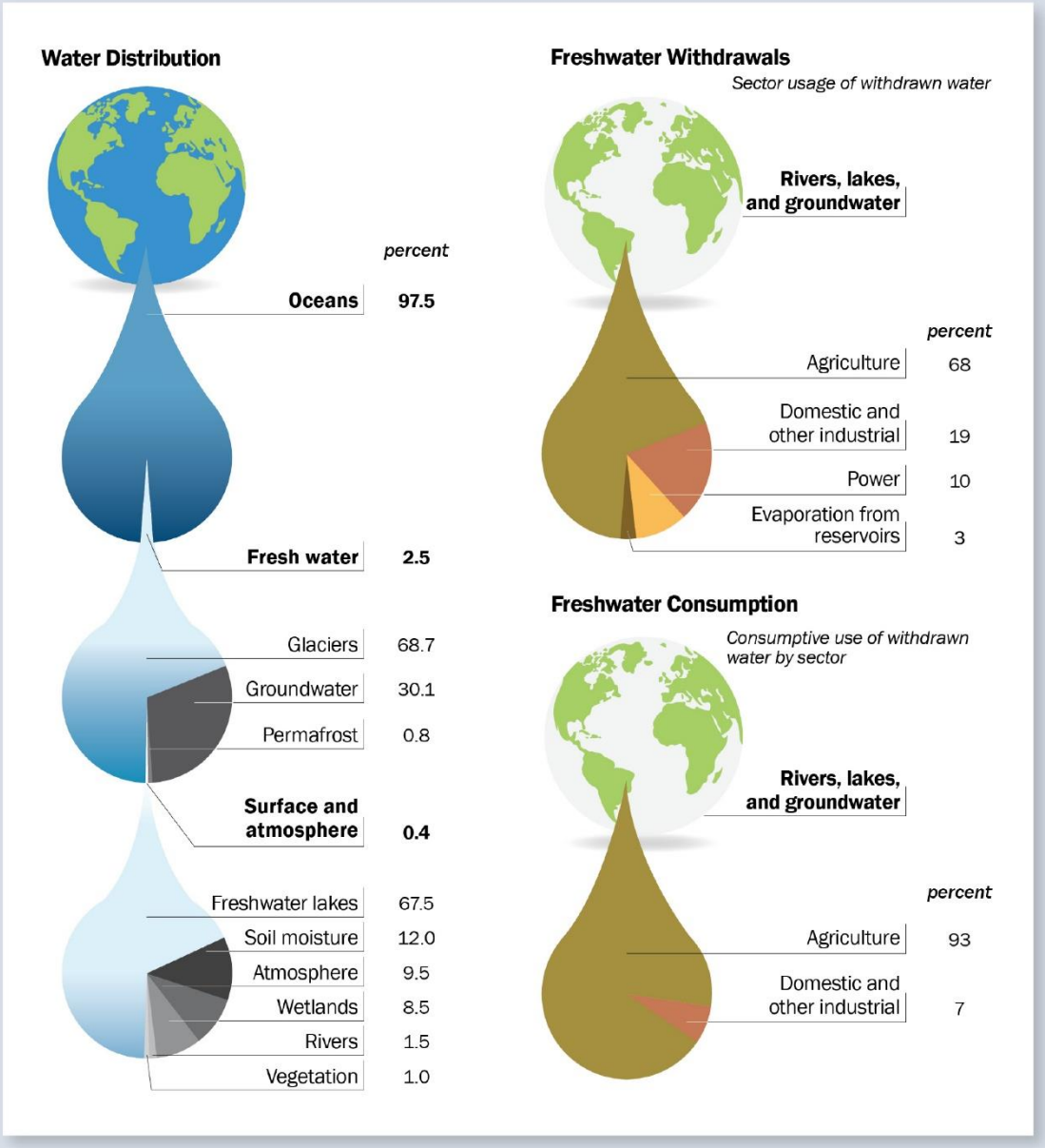
Governments at times have both ignored, or inappropriately invoked climate change or the actions of upstream countries as the primary cause of water insecurity, usually to cover for the failures of environmental governance or to gain or maintain a position of power in a shared water basin.

- In Iran, the government and local scientists have blamed the extensive shrinkage of Lake Urmia in the country's far northwest solely on climate change. Academic research, however, indicates that the nearly tripling of water consumption for irrigation in the basin since the 1980s, the lack of enforced water regulation and environmental laws, and limited wastewater treatment were the main causes of the lake's decline.

Coordination. Lack of coordination among government agencies, the private sector, and civil society frequently leads to mismanagement and the over-allocation of water resources. The interdependencies among water, energy, and food are often not recognized in water governance and management. Most notably, energy, agriculture, and water agencies often do not coordinate water use or water regulations, even when they draw water from the same source. In addition, inadequate monitoring, data collection, and data sharing frequently hinder a government's ability to manage water resources effectively and efficiently.

GRAPHIC 1

THE EARTH'S WATER AND CURRENT HUMAN USE



Note: When humans use water, they affect the quantity, timing, or quality of water available to other users. Water for human use typically involves withdrawing water from lakes, rivers, or groundwater and either consuming it so that it reenters the atmospheric part of the hydrological cycle or returning it to the hydrological basin. When irrigated crops use water, it is consumptive use—it becomes unavailable for use elsewhere in the basin. In contrast, releasing water from a dam to drive hydroelectric turbines is generally a nonconsumptive use because the water is available for downstream users, but not necessarily at the appropriate time. Withdrawals by a city for domestic and industrial use are mainly nonconsumptive, but if the returning water is inadequately treated, the quality of the water downstream is affected.

Source: Multiple, as quoted by World Bank, 2010.

DEVELOPING COUNTRIES VULNERABLE BUT DEVELOPED COUNTRIES NOT IMMUNE

Developing and emerging economies will be most vulnerable to water security risks during the next 20 years, given their naturally complex, variable, and hazardous hydrography and their governance shortcomings. According to the World Bank, if current poor water management policies continue, by 2040 water security will decline in many areas that are not naturally water scarce—such as parts of Central Africa, East and Southeast Asia, and Latin America—and water security will further deteriorate in areas where water resources are naturally in short supply—including large stretches of the Middle East, North Africa, and the Sahel.

- Most Middle East and North African countries are likely to see continued steep declines in their overall water security because of ongoing conflicts, weak or corrupt governments, increasing demand, high levels of pollution, unsustainable ground and surface water use, and natural water scarcity. Countries of particular concern include Egypt, Iraq, Iran, Jordan, Libya, Syria, and Yemen. In addition, many of these countries—including those in the Jordan, Nile, and Tigris River Basins—have ongoing transboundary water disputes with neighbors, potentially further complicating and reducing their ability to more effectively and sustainably manage water resources. Parts of southern Africa, the Sahel, and Horn regions are likely to continue to have high levels of water insecurity, especially the Lake Chad and Nile River Basins, and parts of Mali, Mozambique, Nigeria, Somalia, coastal South Africa, and the Sudans.
- Many countries in South and Central Asia and parts of Southeast Asia are also likely to face declining water security because of corruption, unenforced or poor environmental laws, high levels of pollution, environmentally degrading development, transboundary or internal water disputes, and growing water demand from agriculture, textiles, and fishing. Geopolitical tensions could strain existing water-sharing agreements or prevent future cooperation.
- China, especially the northern region around Beijing and along the Yangtze and Yellow Rivers, is likely to have rising demand and pollution problems because in part to ongoing development projects. China also is likely to contribute to increasing water challenges for its downstream neighbors, such as Bangladesh, India, and Laos, and international trading partners because of its upstream development along transboundary rivers—including the Brahmaputra and Mekong Basins—and its increasing global demand for water intensive goods, such as meat and electronics. Control of critical water sources may also have been a contributing factor in the recent border skirmishes between China and India.
- Within Latin America, Brazil, Bolivia, El Salvador, Honduras, Mexico, Nicaragua, and Venezuela are some of the countries at the highest risk of declining water security through 2040. These countries have some combination of weak governments, large projected population growth, current water security issues, and internal conflict.

Many developed countries are likely to face more frequent and severe water security risks during the next 20 years but most have the technical and economic capacity to adapt to or mitigate the impacts. Most water security challenges in the developed world probably will be localized and short term.

- More arid areas in developed countries probably are at risk of spatially and temporally localized water insecurity, including many parts of Australia and areas along the Black Sea and the Mediterranean.
- The push for economic recovery in the wake of the COVID-19 pandemic is likely to encourage some countries to relax environmental and regulatory laws or support less environmentally friendly development

projects that could cause long-term harm to their water security and overall societal and economic wellbeing.

BROADER IMPLICATIONS OF WATER INSECURITY

More frequent and severe water security problems during the next 20 years are likely to touch almost all elements of global life, including personal security, economic growth, political stability, and interstate conflict.

Personal Security. Declining water security almost always equates to a decrease in individual livelihoods, health, and overall wellbeing and is felt unequally within countries. Poor and vulnerable groups usually pay more proportional to their income than affluent neighbors for water, typically of a lesser quality. This disparity contributes to a water-poverty link where water insecure populations tend to lose more work and education hours to illness or taking care of ill family members and to daily water gathering activities.

- In the developing world, women and children are most often responsible for retrieving water, in many cases traveling several hours to access supplies. In addition, at least 443 million school days are lost each year because of water-related illnesses, according to a development NGO.
- The rural poor disproportionately depend on the natural environment, especially rivers, lakes, and wetland habitats, to sustain or supplement livelihoods and food security. When governments or industry develop water resources without adequate consideration for environmental wellbeing and sustainability, they often widen the poverty gap between rural and urban dwellers.

One of the greatest water security risks is the deterioration of a population's health, particularly the increased prevalence of disease. This deterioration is especially true where water pollution is high and populations lack access to adequate sanitation and wastewater treatment. An estimated 80 percent of all diseases and illnesses in the developing world are waterborne, and others spread more easily when populations lack access to safe water for handwashing, according to UNICEF and the WHO.

- Treatable diarrheal diseases, stemming from drinking unsafe water and a lack of adequate sanitation, cost the lives of at least 1.6 million children under the age of five each year, according to the WHO. Water-related diseases affect at least 1.5 billion people annually.
- Water scarcity has indirect health impacts as well. Already, about half of the developing world's hospital beds are occupied by people with water-related illness, complicating efforts to manage other health crises, such as the current pandemic. Also, as rivers and lakes dry up, animals may seek out drinking water in more heavily populated areas, increasing the chance of contact between humans and wildlife and the disease-carrying insects they host.

Economic Security. Reduced water security during the next 20 years is likely to harm businesses, industries, and the overall economic wellbeing of many countries. Water is essential for creating and maintaining jobs, with at least half of the global workforce employed in water and natural-resource dependent industries, including agriculture, forestry, fisheries, energy, manufacturing, recycling, construction, and transportation. Economic modeling by the World Bank indicates that if current water governance policies are continued, some countries in Sub-Saharan Africa, the Middle East, and Asia GDP growth rates will shrink by as much as 6 percent by 2050 because of water-related losses in agriculture, health, income, and property.

- During the past 25 years, low income countries with access to adequate safe water and sanitation experienced an average GDP growth of 3.7 percent per year. Conversely, countries with limited access to safe water and sanitation but similar incomes averaged growth of only about 0.1 percent in GDP per year during the same time period.

- Companies that responded to a 2016 survey reported $14 billion in water-related impacts, a fivefold increase from 2015, and a quarter of companies experienced detrimental impacts from water. All companies expect water risks to affect them to varying degrees within the next six years.

Political Stability. During the next two decades, declining water security is likely to exacerbate existing social grievances and divisions, potentially triggering or worsening conflict between societal groups and industry sectors and increasing the risk of political instability.

- Many parts of the world have already experienced civil unrest or political discontent because of water-related problems, which are likely to become more frequent and potentially more severe during the next 20 years. In the last 10 years, mass protests related to water, some of which have become violent, have occurred in Algeria, Brazil, China, Egypt, India, Iran, Iraq, and South Africa.

Interstate Relations. Contestation over the management of shared river and groundwater basins probably will increase during the next two to three decades, as water demand, pollution, and environmental degradation increase. Agreements over shared water basins in the past have decreased the risk of conflict among stakeholders, but given the intensification of water security risks and a more competitive geopolitical landscape, cooperation in combination with good water governance and management is likely to be more difficult to achieve in the years ahead.

In addition, in the wake of the COVID-19 pandemic, many governments will face stronger pressure from their populations to improve their economies, requiring adequate and sustainable water supplies. Countries that share a single water resource are likely to feel increasing pressure to gain proprietary rights over the use of that water from neighbors.

Fishing Boats on the Mekong River in Northern Thailand
Upstream Chinese dams in early 2020 severely reduced Mekong River flows through northern Thailand and Laos, degrading fishing and other livelihood activities for downstream populations.

- Approximately 300 surface water basins and 600 shared aquifers cross international borders, but many lack effective, coordinated management mechanisms or sustainable water use agreements.

- The presence of an agreement between countries that share a water resource does not guarantee effective or sustainable management of resources. In some cases—including the Indus and Nile River Basins—the agreement itself is inadequate or does not allow for effective water management, and in some cases constrains governments or reduces their willingness to enact potentially more sustainable water management practices.

Many of the world's most important transboundary basins are already overexploited and severely degraded. We assess that the following basins are at the greatest risk of potential conflict in the next few decades: the Aral Sea Basin, the Brahmaputra River, the Lake Chad Basin, the Euphrates-Tigris Basin, the Indus River Basin, the Jordan River Basin, the Mekong River Basin, and the Nile River Basin.